$\Rightarrow$ Irreflexive Relation: A relation R on the set A is irreflexive if for every $a \in A$, $(a,a) \notin R$.

e.g. $R = \{(1,1), (1,2)\}$ — Not Irreflexive

$R = \{(1,2), (1,3), (2,1)\}$ - Irreflexive

$\rightarrow$ Non-Reflaxive Relation: A relation R on the set A is non-Reflaxive if for some $a \in A$, $(a,a) \in R$, but not all.

$R = \{(1,1), (1,2)\}$ - Non-Reflaxive

$\rightarrow$ Asymmetric Relation: A relation R on the set A is called asymmetric if $(a,b) \in R \Rightarrow (b,a) \notin R$.

* Combining Relations (Operation)

Because relations from A to B are subsets of A X B, two relations from A to B can be combined in any way two sets can be combined.

Ex. $A = \{1,2,3\}$, $B = \{1,2,3,4\}$

$R_1 = \{(1,1), (2,2), (3,3)\}$

$R_2 = \{(1,1), (1,2), (1,3), (1,4)\}$

$R_1 \cup R_2 = \{(1,1), (1,2), (1,3), (1,4), (2,2), (3,3)\}$

$R_1 \cap R_2 = \{(1,1)\}$

$R_1 - R_2 = \{(2,2), (3,3)\}$

$R_2 - R_1 = \{(1,2), (1,3), (1,4)\}$

$R_1 \oplus R_2 = \{(1,2), (1,3), (1,4), (2,2), (3,3)\}$

Composite Relation

→ Let R be a relation from a set A to a set B and S a relation from B to set C. The composite of R and S $(S \circ R)$ is the relation consisting of ordered pair (a, c), where $a \in A$, $c \in C$, and for which there exists an element $b \in B$ such that $(a, b) \in R$ and $(b, c) \in S$.

e.g.

$$R : \{1, 2, 3\} \rightarrow \{1, 2, 3, 4\}$$

$$R = \{(1,1), (1,4), (2,3), (3,1), (3,4)\}$$

$$S : \{1, 2, 3, 4\} \rightarrow \{0, 1, 2\}$$

$$S = \{(1,0), (2,0), (3,1), (3,2), (4,1)\}$$

$$S \circ R = \{(1,0), (1,1), (2,1), (2,2), (3,0), (3,1)\}$$

→ The powers of a transitive relation R are subsets of this relation; that is, $R^m \subseteq R$, $m = 1, 2, 3, \ldots$